

REMARKS

This is in response to the Office Action mailed on March 24, 2004.

Claims 1, 6, 11, 22-24, 51, and 52 are amended. Claims 1-25, and 51-63 are now pending in this application.

Applicant amends claims 1, 6, 11, 22-24, 51, and 52 for clarity. These amendments are not made in response to any to any substantive rejection.

Reservation of the Right to Swear Behind References

Applicant maintains the right to swear behind any references which are cited in a rejection under 35 U.S.C. §§102(a), 102(e), 103/102(a), and 103/102(e). Statements distinguishing the claimed subject matter over the cited references are not to be interpreted as admissions that the references are prior art.

Overview of the rejection of the claims

The Office Action relied on the Kunimoto et al. patent (Kunimoto) in combination with a first cited art to reject some of the claims of the present invention for obviousness under 35 USC §103 (a).

The Office Action also relied on the Lin et al. patent (Lin) in combination with the first cited art and with a number of other cited art to reject all of the claims of the present invention for obviousness under 35 USC §103 (a). For clarity, the names of the first and the other cited art are omitted in this section.

Overview of Kunimoto

Kunimoto discloses in FIG. 20 through FIG. 22 and FIG. 24 through FIG. 26 a conductive plug 49, a reaction protective layer 53 formed on conductive plug 49, and a conductive layer 54 formed on reaction protective layer 53.

Overview of Lin

Lin discloses in several embodiments a method of forming a capacitor based on one principle that Lin describes in FIG. 2A through FIG. 2D. The principle includes forming a plug, forming a number of diffusion barrier layers on the plug, and forming a conductive layer on the number of diffusion barrier layers.

Lin discloses in a first embodiment (FIG. 8A through FIG. 8K) a capacitor having a plug 38A, a first diffusion barrier layer 39 made of Ti formed on plug 38A, a second diffusion barrier layer 40 made of TiN formed on the Ti layer 39, and a conductive layer 41A formed on diffusion barrier layers 39 and 40.

Similarly, Lin also discloses in a second embodiment (FIG. 9A through FIG. 9H) a capacitor having a plug 62, a first diffusion barrier layer (not shown in FIG. 9A through FIG. 9H) made of Ti formed on plug 62, a second diffusion barrier layer (not shown in FIG. 9A through FIG. 9H) made of TiN formed on the Ti layer, and a conductive layer 65 formed on the Ti and TiN diffusion barrier layers. Although Lin does not show the Ti and TiN diffusion barrier layers in FIG. 9A through FIG. 9H, Lin specifically states in column 7, lines 44-48 that the Ti and TiN diffusion barrier layers are formed on plug 62 for use as a diffusion barrier, which is consistent with the principle that Lin describes in FIG. 2A through FIG. 2D.

Using the same principle described in FIG. 2A through FIG. 2D, Lin also discloses in a third embodiment (FIG. 10A through FIG. 10G) a capacitor having a plug 162, a first diffusion barrier layer (not shown in FIG. 10A through FIG. 10G) made of Ti formed on plug 162, a second diffusion barrier layer (not shown in FIG. 10A through FIG. 10G) made of TiN formed on the Ti layer, and a conductive layer 165 formed on the Ti and TiN diffusion barrier layers. Although Lin does not show the Ti and TiN diffusion barrier layers in FIG. 10A through FIG. 10G, Lin specifically states in column 9, lines 3-11 that the Ti and TiN diffusion barrier layers are formed on plug 162 for use as a diffusion barrier.

Applicant's overall response to the rejection

Applicant respectfully disagrees with the obviousness rejections based on the combination of Kunimoto and the first cited art because Applicant is unable to find in the

combination of Kunimoto and the first cited art all of the elements recited in the claims of the present invention.

Applicant also respectfully disagrees with the obviousness rejections based on the combination of Lin and the cited art because Applicant is also unable to find in the combination of Lin and the cited art all of the elements recited in the claims of the present invention.

For example, the claims of the present invention recite, among other things, a conductive plug, and a “single” electrode formed “directly” on the conductive plug. The conductive layer recited in the claims of the present invention is formed “directly” on the conductive plug to serve both as capacitor plate and as a diffusion barrier. In contrast, each of the Kunimoto and Lin patents requires one or more separate diffusion barrier layers formed between the conductive plug and the conductive layer. Applicant is unable to find in any combination of Kunimoto or Lin and the cited art a suggestion or a motivation to form a “single” electrode in which the single electrode is formed “directly” on the conductive plug. Accordingly, Applicant requests that the rejection be reconsidered and withdrawn and that the claims of the present invention be allowed.

§112 Rejection of the Claims

Claims 1-15, 22-24, 51, and 52 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Applicant respectfully traverses and asserts that these claims meet the requirements of §112, second paragraph. Applicant requests that the rejection be reconsidered and withdrawn. Applicant believes that claims 1-5, 22-24, 51, and 52 are now in condition for allowance.

§103 Rejection of the Claims

Claims 1, 3-6, 8, 9, 11, 13-16, 18, and 54 were rejected under 35 USC § 103(a) as being unpatentable over Kunitomo et al. (U.S. Patent No. 6,235,572) in view of Summerfelt et al. (U.S. Patent No. 5,622,893).

Independent claim 1 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Kunimoto and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Therefore, Applicant

requests that the rejection of claim 1 and dependent claims 3-5 be reconsidered and withdrawn and that claims 1, and 3-5 be allowed.

Independent claim 6 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Kunimoto and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Accordingly, Applicant requests that the rejection of claim 6 and dependent claims 8 and 9 be reconsidered and withdrawn and that claims 6, 8, and 9 be allowed.

Independent claim 11 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Kunimoto and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Therefore, Applicant requests that the rejection of claim 11 and dependent claims 13-15 be reconsidered and withdrawn and that claims 11, and 13-15 be allowed.

Independent claim 16 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Kunimoto and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Thus, Applicant requests that the rejection of claim 16 and dependent claim 18 be reconsidered and withdrawn and that claims 16 and 18 be allowed.

Independent claim 54 recites, among other things, “a first single conductive layer formed directly on the capacitor plug”. Applicant is unable to find in Kunimoto and Summerfelt et al. “a first single conductive layer formed directly on the capacitor plug”. Therefore, Applicant requests that the rejection of claim 54 be reconsidered and withdrawn and that claim 54 be allowed.

Claims 1-25, 54, and 55 were rejected under 35 USC § 103(a) as being unpatentable over Lin et al. (U.S. Patent No. 6,249,040) in view of Summerfelt et al.

Independent claim 1 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Lin and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Thus, Applicant requests that the rejection of claim 1 and dependent claims 2-5 be reconsidered and withdrawn and that claims 1-5 be allowed.

Independent claim 6 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Lin and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Therefore, Applicant requests that the rejection of claim 6 and dependent claims 7-10 be reconsidered and withdrawn and that claims 6-10 be allowed.

Independent claim 11 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Lin and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Therefore, Applicant requests that the rejection of claim 11 and dependent claims 12-15 be reconsidered and withdrawn and that claims 11-15 be allowed.

Independent claim 16 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Lin and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Thus, Applicant requests that the rejection of claim 16 and dependent claims 17-20 be reconsidered and withdrawn and that claims 16-20 be allowed.

Independent claim 21 recites, among other things, “first single electrode formed directly on the conductive plug”. Applicant is unable to find in Lin and Summerfelt et al. “first single electrode formed directly on the conductive plug”. Accordingly, Applicant requests that the rejection of claim 21 be reconsidered and withdrawn and that claim 21 be allowed.

Independent claim 22 recites, among other things, “a first single electrode directly contacting the conductive plug”. Applicant is unable to find in Lin and Summerfelt et al. “a first single electrode directly contacting the conductive plug”. Hence, Applicant requests that the rejection of claim 22 be reconsidered and withdrawn and that claim 22 be allowed.

Independent claim 23 recites, among other things, “a first single electrode directly contacting the conductive plug”. Applicant is unable to find in Lin and Summerfelt et al. “a first single electrode directly contacting the conductive plug”. Therefore, Applicant requests that the rejection of claim 23 be reconsidered and withdrawn and that claim 23 be allowed.

Independent claim 24 recites, among other things, “a first single electrode directly contacting the conductive plug”. Applicant is unable to find in Lin and Summerfelt et al. “a first

single electrode directly contacting the conductive plug”. Thus, Applicant requests that the rejection of claim 24 be reconsidered and withdrawn and that claim 24 be allowed.

Independent claim 25 recites, among other things, “a first electrode having a substance that is selected from a group consisting of TiN, TiON, WN_x, TaN, Ta, Pt, Pt-Rh, Pt-RhO_x, Ru, RuO_x, Ir, IrO_x, Pt-Ru, Pt-RuO_x, Pt-Ir, Pt-IrO_x, SrRuO₃, Au, Pd, Al, Mo, Ag, and Poly-Si”. Applicant is unable to find in Lin and Summerfelt et al. “a first electrode having a substance that is selected from a group consisting of TiN, TiON, WN_x, TaN, Ta, Pt, Pt-Rh, Pt-RhO_x, Ru, RuO_x, Ir, IrO_x, Pt-Ru, Pt-RuO_x, Pt-Ir, Pt-IrO_x, SrRuO₃, Au, Pd, Al, Mo, Ag, and Poly-Si”. Thus, Applicant requests that the rejection of claim 25 be reconsidered and withdrawn and that claim 25 be allowed.

Independent claim 54 recites, among other things, “a first single conductive layer formed directly on the capacitor plug”. Applicant is unable to find in Lin and Summerfelt et al. “a first single conductive layer formed directly on the capacitor plug”. Therefore, Applicant requests that the rejection of claim 54 and dependent claim 55 be reconsidered and withdrawn and that claims 54 and 55 be allowed.

Claim 51 was rejected under 35 USC § 103(a) as being unpatentable over Kunitomo et al. in view of Summerfelt et al., and further in view of Kotecki et al. (U.S. Patent No. 6,262,450).

Independent claim 51 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Kunitomo, Summerfelt et al., and Kotecki et al. “a single conductive layer formed directly on the metallization layer”. Thus, Applicant requests that the rejection of claim 51 be reconsidered and withdrawn and that claim 51 be allowed.

Claims 52 and 53 were rejected under 35 USC § 103(a) as being unpatentable over Cloud et al. (U.S. Patent No. 5,815,427) in view of Kunitomo et al. and Summerfelt et al.

Independent claim 52 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Cloud et al., Kunitomo, and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Thus, Applicant requests that the rejection of claim 52 be reconsidered and withdrawn and that claim 52 be allowed.

Independent claim 53 recites, among other things, “a single conductive layer formed directly on the metallization layer”. Applicant is unable to find in Cloud et al., Kunimoto, and Summerfelt et al. “a single conductive layer formed directly on the metallization layer”. Thus, Applicant requests that the rejection of claim 53 be reconsidered and withdrawn and that claim 53 be allowed.

Claims 56-58 were rejected under 35 USC § 103(a) as being unpatentable over Lin et al. in view of Summerfelt et al., and further in view of Matsubara et al. (U.S. Patent No. 6,306,699).

Independent claim 56 recites, among other things, “a first single conductive layer formed directly on the capacitor plug”. Applicant is unable to find in Lin, Summerfelt et al., and Matsubara et al. “a first single conductive layer formed directly on the capacitor plug”. Thus, Applicant requests that the rejection of claim 56 and dependent claim 57 be reconsidered and withdrawn and that claims 56 and 57 be allowed.

Independent claim 58 recites, among other things, “a first conductive layer formed directly on the capacitor plug”. Applicant is unable to find in Lin, Summerfelt et al., and Matsubara et al. “a first conductive layer formed directly on the capacitor plug”. Therefore, Applicant requests that the rejection of claim 58 be reconsidered and withdrawn and that claim 58 be allowed.

Claims 59 and 60 were rejected under 35 USC § 103(a) as being unpatentable over Lin et al. in view of Summerfelt et al., and further in view of Shimazu et al. (U.S. Patent No. 6,686,274).

Independent claim 59 recites, among other things, “a first single conductive layer formed directly on the single capacitor plug”. Applicant is unable to find in Lin, Summerfelt et al., and Shimazu et al. “a first single conductive layer formed directly on the single capacitor plug”. Therefore, Applicant requests that the rejection of claim 59 and dependent claim 60 be reconsidered and withdrawn and that claims 59 and 60 be allowed.

Claims 61-63 were rejected under 35 USC § 103(a) as being unpatentable over Lin et al. in view of Summerfelt et al., Matsubara et al., and further in view of Shimazu et al.

Independent claim 61 recites, among other things, “a first single conductive layer formed directly on the single capacitor plug”. Applicant is unable to find in Lin, Summerfelt et al.,

Matsubara et al., and Shimazu et al. “a first single conductive layer formed directly on the single capacitor plug”. Accordingly, Applicant requests that the rejection of claim 61 and dependent claim 62 be reconsidered and withdrawn and that claims 61 and 62 be allowed.

Independent claim 63 recites, among other things, “a single conductive layer formed directly on the capacitor plug” and “a second conductive layer formed directly on the dielectric layer, the second conductive layer including a material selected from a group consisting of TiN, TiON, WN_x, TaN, Ta, Pt, Pt-Rh, Pt-RhO_x, Ru, RuO_x, Ir, IrO_x, Pt-Ru, Pt-RuO_x, Pt-Ir, Pt-IrO_x, SrRuO₃, Au, Pd, Al, Mo, Ag, and Poly-Si, wherein the second conductive layer includes a conductive portion formed below a surface of the first conductive layer”. Applicant is unable to find in Lin, Summerfelt et al., Matsubara et al., and Shimazu et al. “a single conductive layer formed directly on the capacitor plug” and “a second conductive layer formed directly on the dielectric layer, the second conductive layer including a material selected from a group consisting of TiN, TiON, WN_x, TaN, Ta, Pt, Pt-Rh, Pt-RhO_x, Ru, RuO_x, Ir, IrO_x, Pt-Ru, Pt-RuO_x, Pt-Ir, Pt-IrO_x, SrRuO₃, Au, Pd, Al, Mo, Ag, and Poly-Si, wherein the second conductive layer includes a conductive portion formed below a surface of the first conductive layer”. Accordingly, Applicant requests that the rejection of claim 63 be reconsidered and withdrawn and that claim 63 be allowed.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's representative at (612) 373-6969 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

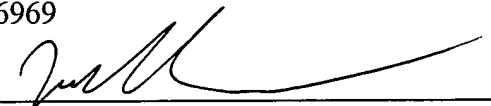
Respectfully submitted,

CEM BASCERI ET AL.

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Date July 26, 2004

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 26 day of July, 2004.

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Name

Signature